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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,329	04/14/2004	Yeshwanth Narendar	1035-E4371	5396
34456 7590 12/28/2007 LARSON NEWMAN ABEL POLANSKY & WHITE, LLP 5914 WEST COURTYARD DRIVE SUITE 200 AUSTIN, TX 78730			EXAMINER MALDONADO, JULIO J	
			ART UNIT 2823	PAPER NUMBER
			MAIL DATE 12/28/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/824,329	<b>Applicant(s)</b> NARENDAR ET AL.	
	<b>Examiner</b> Julio J. Maldonado	<b>Art Unit</b> 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,4-11 and 14-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-11 and 14-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>11/22/2007</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 4-9, 14-19 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thilderkvist et al. (U.S. 6,277,194 B1, hereinafter Thilderkvist) in view of Kumar et al. (U.S. 2003/0198749 A1, hereinafter Kumar).

Thilderkvist teaches a semiconductor processing component comprising silicon carbide (SiC), wherein an outer surface of said component consist of a coated layer of SiC, and wherein said coated layer is treated to reduce the amount of contaminants therein, and wherein said SiC component is a SiC reaction chamber component (Thilderkvist, column 3, line 41 – column 5, line 11).

Thilderkvist fails to disclose wherein said coated SiC is a CVD-SiC. However, Kumar teach a semiconductor processing component comprising silicon carbide (SiC) impregnated with silicon (Si), wherein an outer surface portion of the component consist of CVD-SiC, and wherein said CVD-SiC is clean (Kumar, [0009], [0023] and [0030]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Thilderkvist and Kumar to substitute the coated SiC of Thilderkvist et al. with a CVD-SiC according to the teachings of Kumar

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because the selection of a known material based on its suitability for its intended use supported a prima facie obviousness. See MPEP 2144.05.

Still, the combined teachings of Thilderkvist and Kumar fail to disclose wherein said CVD-SiC has a surface impurity level that is not greater than five times a bulk impurity level. However, the selection of the claimed impurity concentration is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired cleaned SiC, and furthermore because both, Thilderkvist and Kumar are directed to a semiconductor component having reduced impurity levels. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the combined teachings of Thilderkvist and Kumar to arrive at the claimed invention.

The combined teachings of Thilderkvist and Kumar substantially teach all aspects of the invention but fail to disclose wherein the bulk impurity level is measured at a depth of at least  $3\text{ }\mu\text{m}$  from an outer surface of the outer surface portion; and wherein the CVD-SiC layer has a thickness within a range of about 10 to about 1,000  $\mu\text{m}$ . Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the combined teachings of Thilderkvist and Kumar to arrive at the claimed invention.

The combined teachings of Thilderkvist and Kumar teach wherein contaminants within the semiconductor components include iron (Fe), copper (Cu) and nickel (Ni), for example (Thilderkvist, column 2, lines 31 – 45), but fail to disclose wherein the bulk impurity level is not greater than  $1 \times 10^{17}$  atoms/ccFe and not greater than  $1 \times 10^{15}$

atoms/ccCr. However, the selection of the impurity level range is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired cleaned SiC surface, and furthermore, because Thilderkvist and Kumar are directed to a semiconductor component having reduced metal impurity levels on its surface. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Thilderkvist in view of Kumar to arrive at the claimed invention.

The combined teachings of Thilderkvist and Kumar teach a non-preferred embodiment of the invention wherein the component is machined prior to treatment to provide said surface impurity level (Kumar, [0010]). Although not taught as a preferred embodiment, the combination of Thilderkvist and Kumar teaches this embodiment nonetheless, and disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In re Susi, 169 USPQ 423 (CCPA 1971). "A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994). A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. Merck & Co. v. Biocraft Laboratories, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). Even a teaching away from a claimed invention does not render the invention patentable. See Celeritas Technologies Ltd. v. Rockwell International Corp., 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998), where the court held

that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed." To further clarify, a prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not preclude utility of the invention for that or another purpose, or even preferability of the invention for another purpose.

3. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thilderkvist ('194) in view of Kumar ('749) as applied to claims 1, 4-9, 14-19 and 21 above, and further in view of Bosch (U.S. 6,890,861 B1).

The combined teachings of Thilderkvist and Kumar substantially teach all aspects of the invention including forming the semiconductor component using a sintering process (Kumar, [0009], [0023] and [0030]), but fail to disclose wherein said components are formed by a CVD process. However, Bosch teaches silicon carbide components or silicon carbide/silicon components such as liners, process tubes, paddles and boats, formed by either sintering and/or CVD processes (Bosch, column 3, lines 32 – 38). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Thilderkvist and Kumar to enable the components of Thilderkvist and Kumar to be formed according to the teachings of Bosch because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of forming the disclosed components of Thilderkvist and Kumar and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

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4. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thilderkvist ('194) in view of Kumar ('749) and Goldstein et al. (U.S. 5,494,439, hereinafter Goldstein).

Thilderkvist teach a semiconductor processing component comprising silicon carbide (SiC), wherein an outer surface of said component consist of a coated layer of SiC, and wherein said coated layer is treated to reduce the amount of contaminants therein, and wherein said SiC component is a SiC reaction chamber component (Thilderkvist, column 3, line 41 – column 5, line 11).

Thilderkvist fails to disclose wherein said coated SiC is a CVD-SiC. However, Kumar teach a semiconductor processing component comprising silicon carbide (SiC) impregnated with silicon (Si), wherein an outer surface portion of the component consist of CVD-SiC, and wherein said CVD-SiC is clean (Kumar, [0009], [0023] and [0030]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Thilderkvist and Kumar to substitute the coated SiC of Thilderkvist with a CVD-SiC according to the teachings of Kumar because the selection of a known material based on its suitability for its intended use supported a prima facie obviousness. See MPEP 2144.05.

Still, the combined teachings of Thilderkvist and Kumar fail to disclose wherein said CVD-SiC has a surface impurity level that is not greater than five times a bulk impurity level. However, the selection of the claimed impurity concentration is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired cleaned SiC

surface, and furthermore because both, Thilderkvist and Kumar are directed to a semiconductor component having reduced impurity levels. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the combined teachings of Thilderkvist and Kumar to arrive at the claimed invention.

The combined teachings of Thilderkvist and Kumar substantially teach all aspects of the invention but fail to disclose wherein the bulk impurity level is measured at a depth of at least 3  $\mu\text{m}$  from an outer surface of the outer surface portion; wherein the CVD-SiC layer has a thickness within a range of about 10 to about 1,000  $\mu\text{m}$ . One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired SiC dimensions. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

The combined teachings of Thilderkvist and Kumar substantially teach all aspects of the invention but fail to disclose wherein the SiC component is a wafer boat.



However, Goldstein (Figs.1-3) teaches a semiconductor processing component comprising an ultraclean SiC surface, wherein said outer surface portion of the component is free from metal impurities, wherein said surface is cleaner than an interior bulk of said semiconductor component, and wherein said metal impurities comprise aluminum, sodium and iron (Goldstein, column 2, line 47 – column 8, line 7), and wherein said component may include boats, cantilevers, tubes, liners, pedestals and pins (Goldstein, column 3, lines 2 – 4).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Thilderkvist and Kumar to enable the components of the reaction chamber of Thilderkvist and Kumar according to the teachings of Goldstein because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable components in Thilderkvist and Kumar and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

### ***Response to Arguments***

5. Applicants' arguments filed 10/22/2007 have been fully considered but they are not persuasive.

Applicants argue, "...While the prior art indeed teaches purification of an outer surface of a semiconductor component, purification is carried out by use of a sacrificial layer, in which a sacrificial layer is deposited on the component to undergo purification, followed by diffusion of impurities into the sacrificial layer and removal of the sacrificial layer. Diffusion is carried out by short (several minutes) of heat treatment. Essentially,

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the prior art teaches use of sacrificial layers to collect or "getter" contaminants from an outer surface of a SiC component. Applicants have discovered that such gettering processes are ineffective to purify processing components to the impurity level claimed, notably, at 2X the bulk impurity level and below...While Applicants note that Thilderkvist et al. make passing reference to repeated cleaning, such repeated cleaning steps do not result in the claimed impurity level according to Applicants' technical studies. At best, Thilderkvist et al. merely suggest or invite one of ordinary skill in the art to repeat the described process to achieve the desired purity; nevertheless, the described technology of use of a sacrificial layer to getter impurities is fundamentally inferior technology relative to the use of a material subtractive process to enhance surface impurity...".

In response to the applicants' arguments, Thilderkvist teaches a semiconductor processing component comprising silicon carbide (SiC), wherein an outer surface of said component consist of a coated layer of SiC, and wherein said coated layer is treated to reduce the amount of contaminants therein, and wherein said SiC component is a SiC reaction chamber component (Thilderkvist, column 3, line 41 – column 5, line 11). The applicants assert that Thilderkvist fail to disclose a level of cleanliness of the silicon carbide layer. But as the applicants point out Thilderkvist is open to perform the cleaning process several times until a desired cleaned SiC surface is obtained (Thilderkvist, column 5, lines 12 – 55).

Furthermore, according to the declaration under 37 C.F.R. §1.132, the applicants disclose that the process of Thilderkvist would not arrive at the claimed semiconductor

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processing component. However, in view of the teachings of Thilderkvist, the claimed invention would flow naturally from the manipulation of well-known parameters (e.g., temperature, time, etc) to one of ordinary skill in the art. The examiner acknowledges that the results disclosed in the declaration are different from the claimed limitations. However, these results are one of many that would be achieved by the process of Thilderkvist.

### ***Conclusion***

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Applicants are encouraged, where appropriate, to check Patent Application Information Retrieval (PAIR) (<http://portal.uspto.gov/external/portal/pair>) which provides applicants direct secure access to their own patent application status information, as well as to general patent information publicly available.

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8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.


9. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax number for this group is 571-273-8300. Updates can be found at

<http://www.uspto.gov/web/info/2800.htm>.



Julio J. Maldonado  
December 14, 2007

Julio J. Maldonado  
Patent Examiner  
Art Unit 2823

  
GEORGE R. FOURSON  
PRIMARY EXAMINER